“*Research Needs and Opportunities for Micro-CT of Microcirculatory Structure and Function*”

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Multi Resolution 3D Micro-CT Imaging

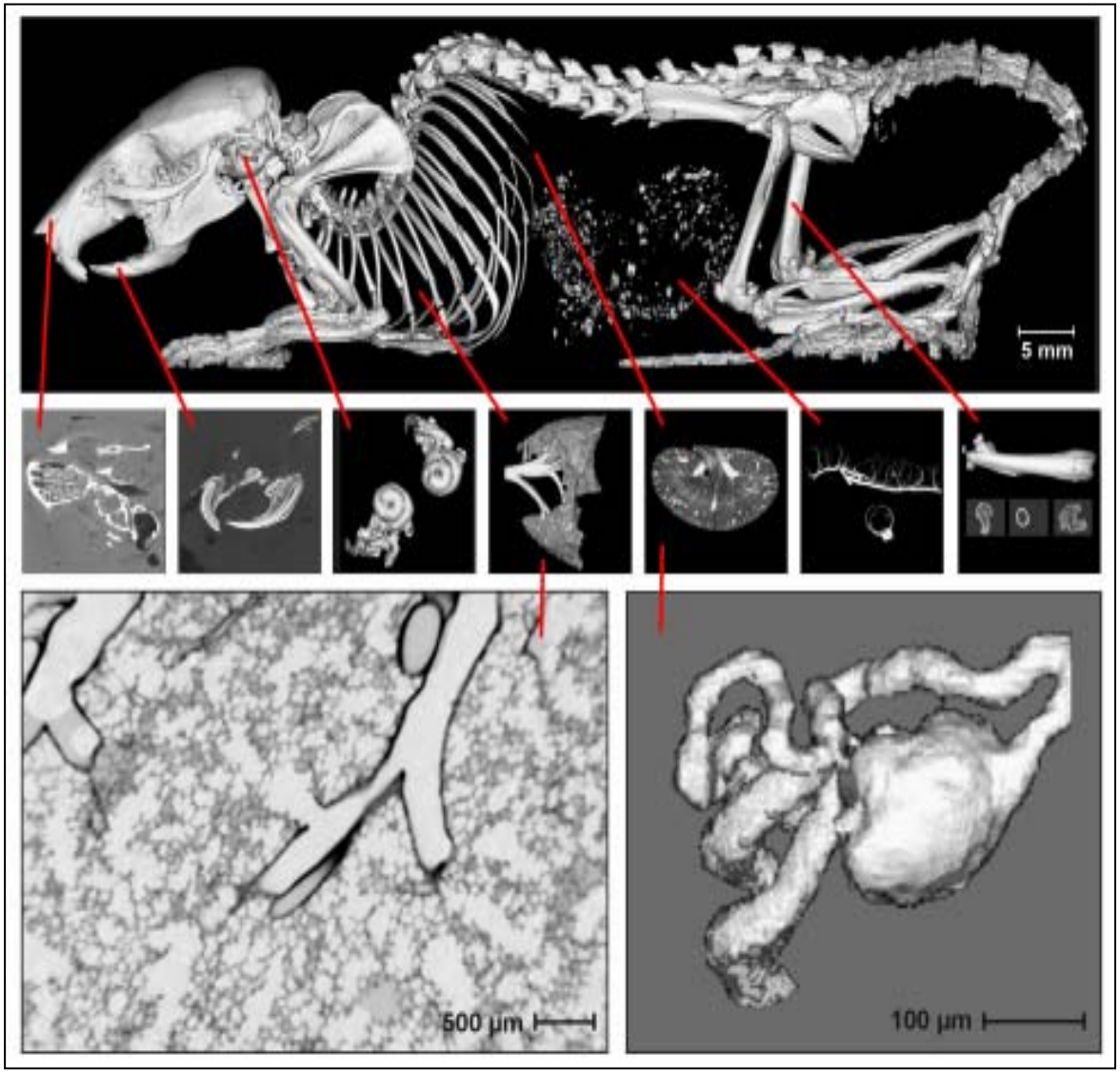
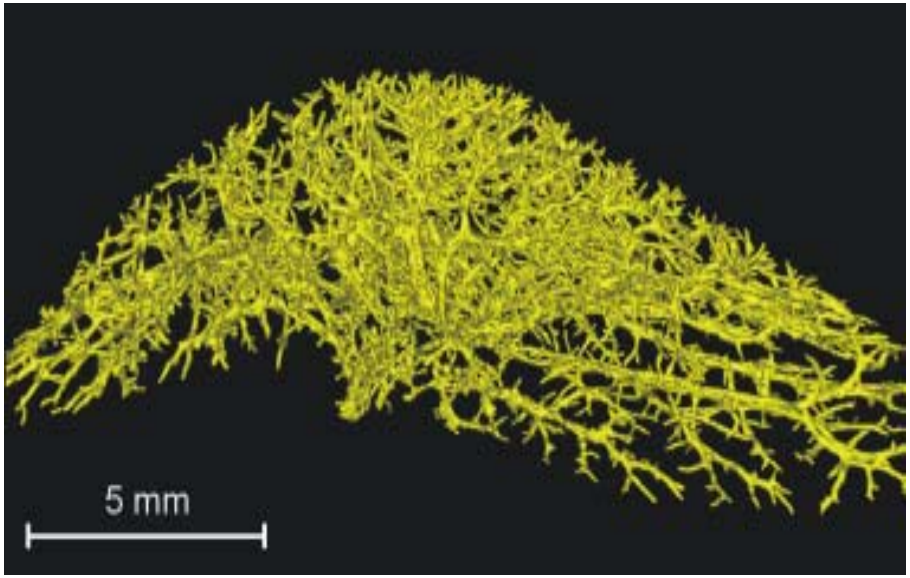


Fig.1

3D Micro-CT Images of Biliary / Vascular Trees

(Microfil, 20 μm cubic voxels)

Rat Biliary Tree



Mouse Coronary Tree

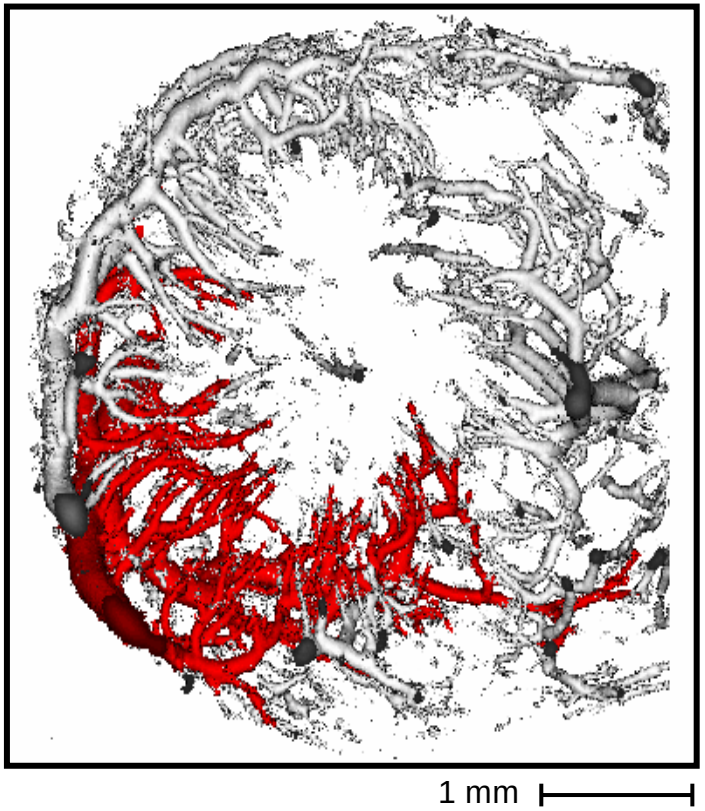


Fig.2

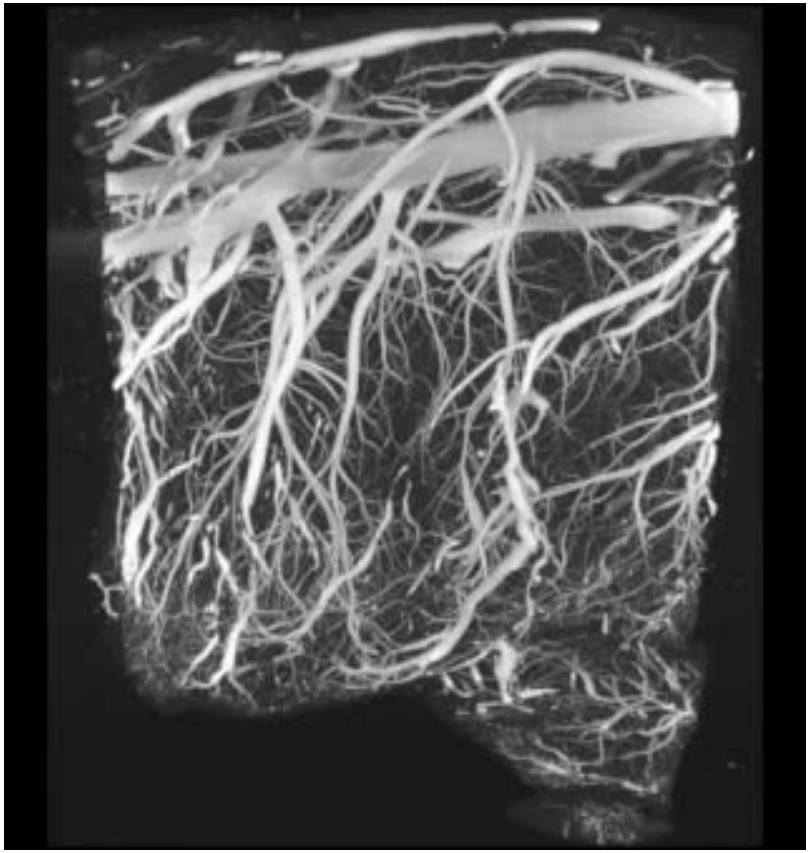
Pig Myocardial Micro Circulation

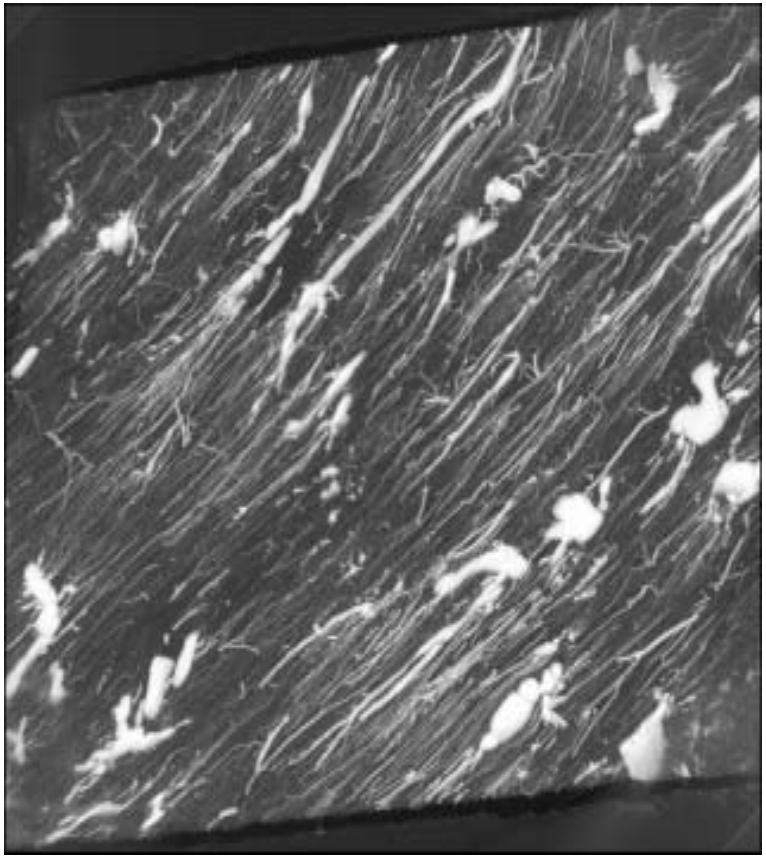
(Micro-CT, microfil in voxel lumen)

20 μm Voxel Image

Epicardium

4 μm Voxel Image





2 mm

Endocardium

250 μm

Fig.3

3D Micro-CT Images of Colonic Vasculature

(Control and tumor bearing mice)

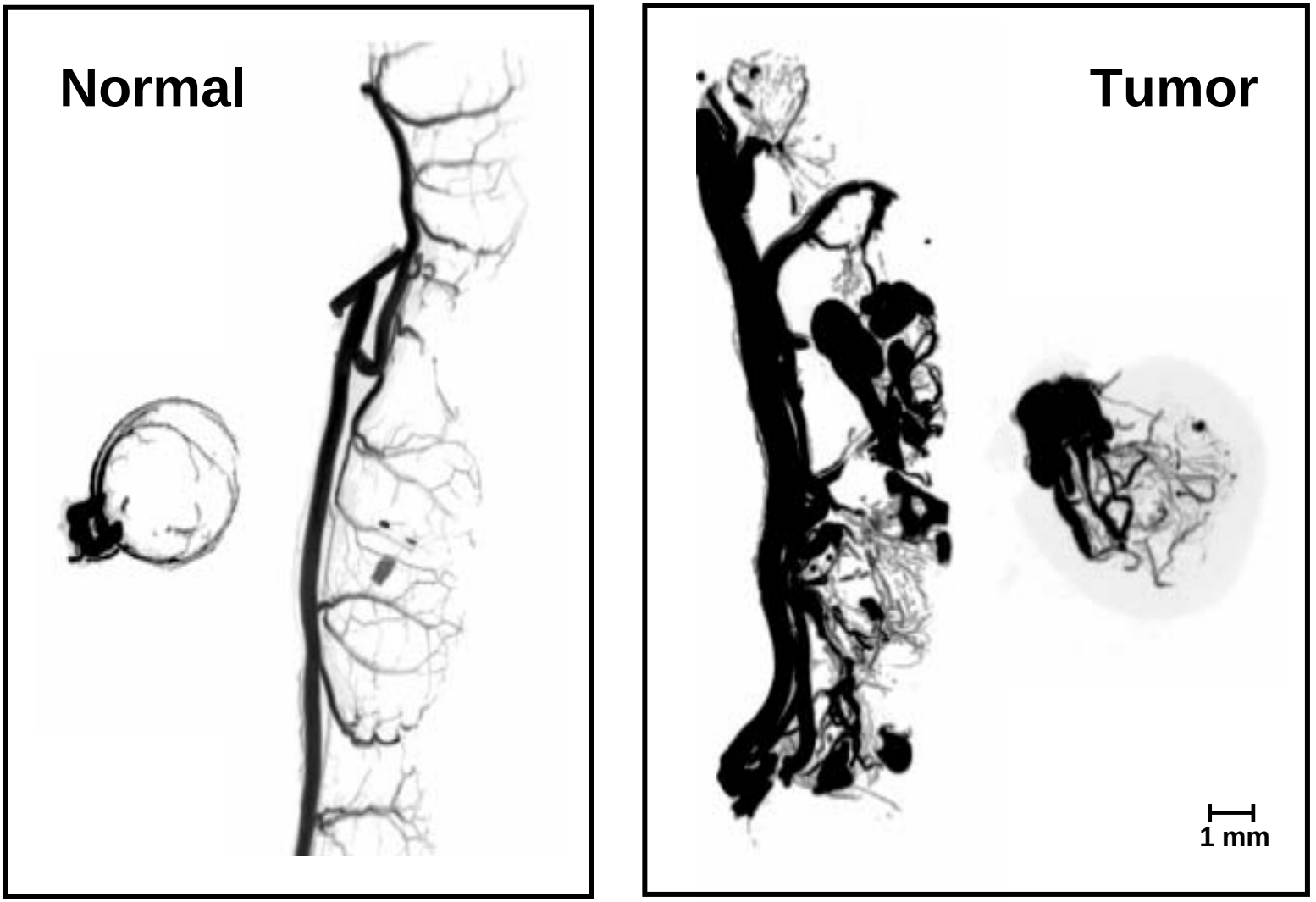


Fig.4

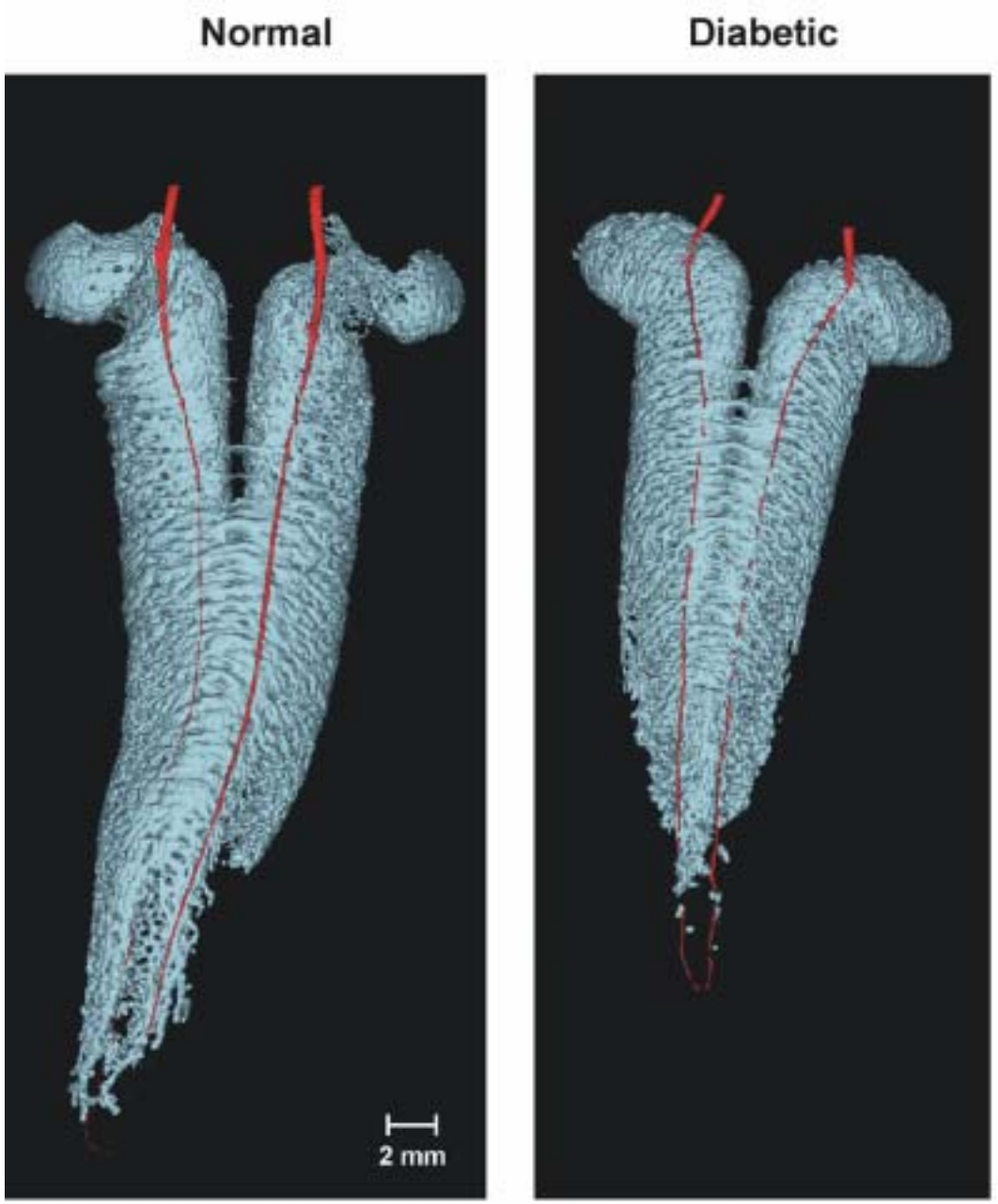
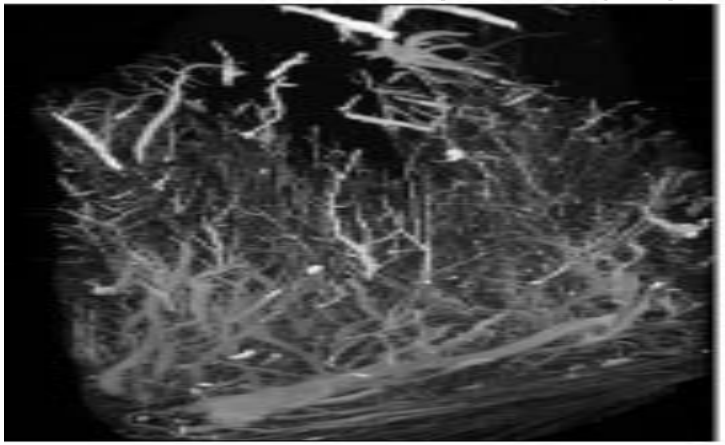


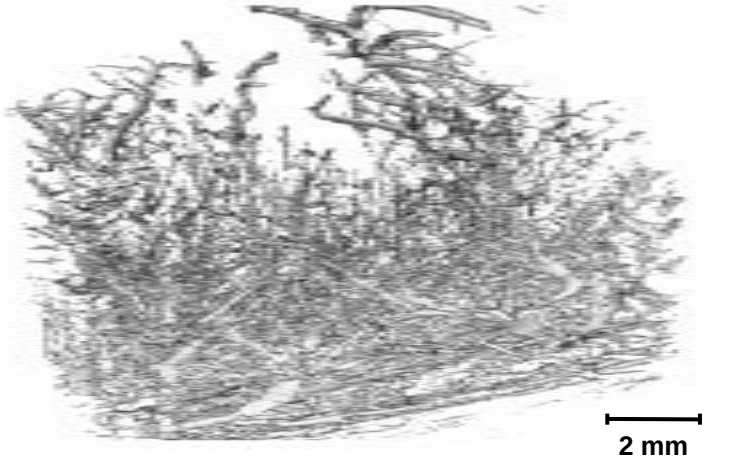
Fig.5

Micro-CT Projections of Pig Myocardium

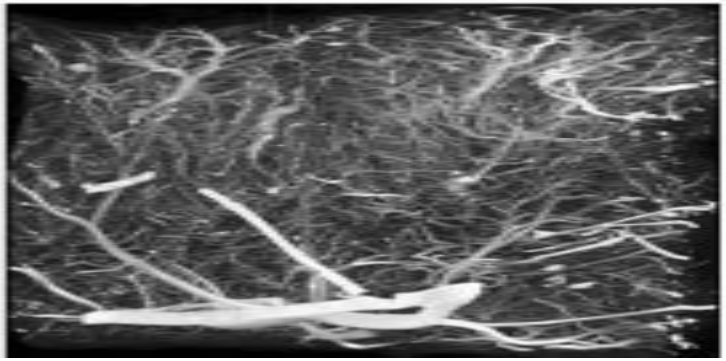
(Reconstruction voxel: 21 μm; Display voxel: 30 μm)

Normal (752 myo)





Hypercholesterolemia (396 myo)



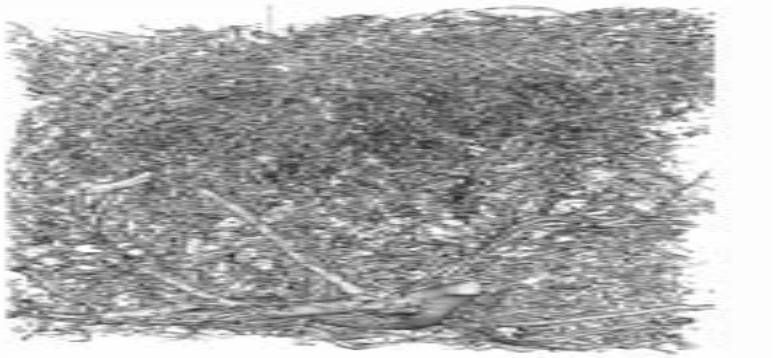
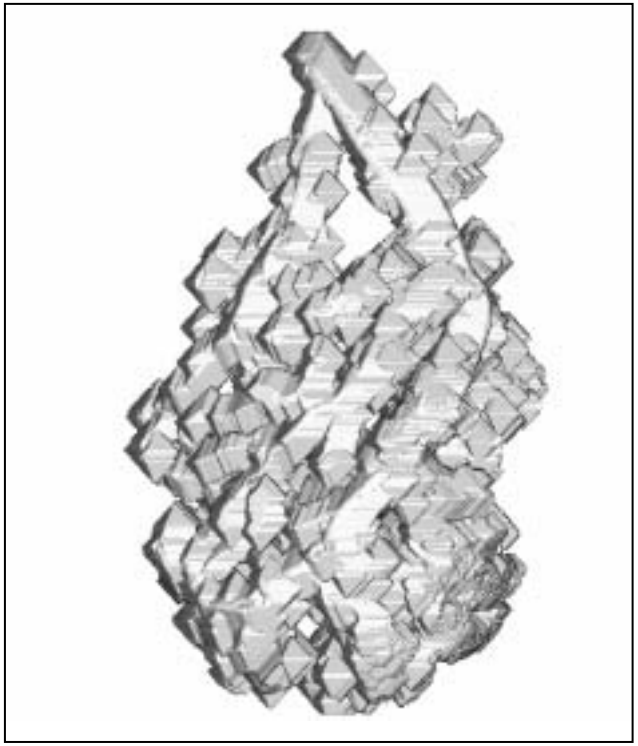


Fig.6

Coronary Diameter & Myocardial Volume Perfused by Artery

(Rat, micro-CT, 21μm voxel, microfil)

Arterial lumen



“Dilated” lumen = perfusion territory

Fig.7

Volume of Myocardium Perfused by its Coronary Artery

(Micro-CT 3D image analysis of isolated rat hearts)

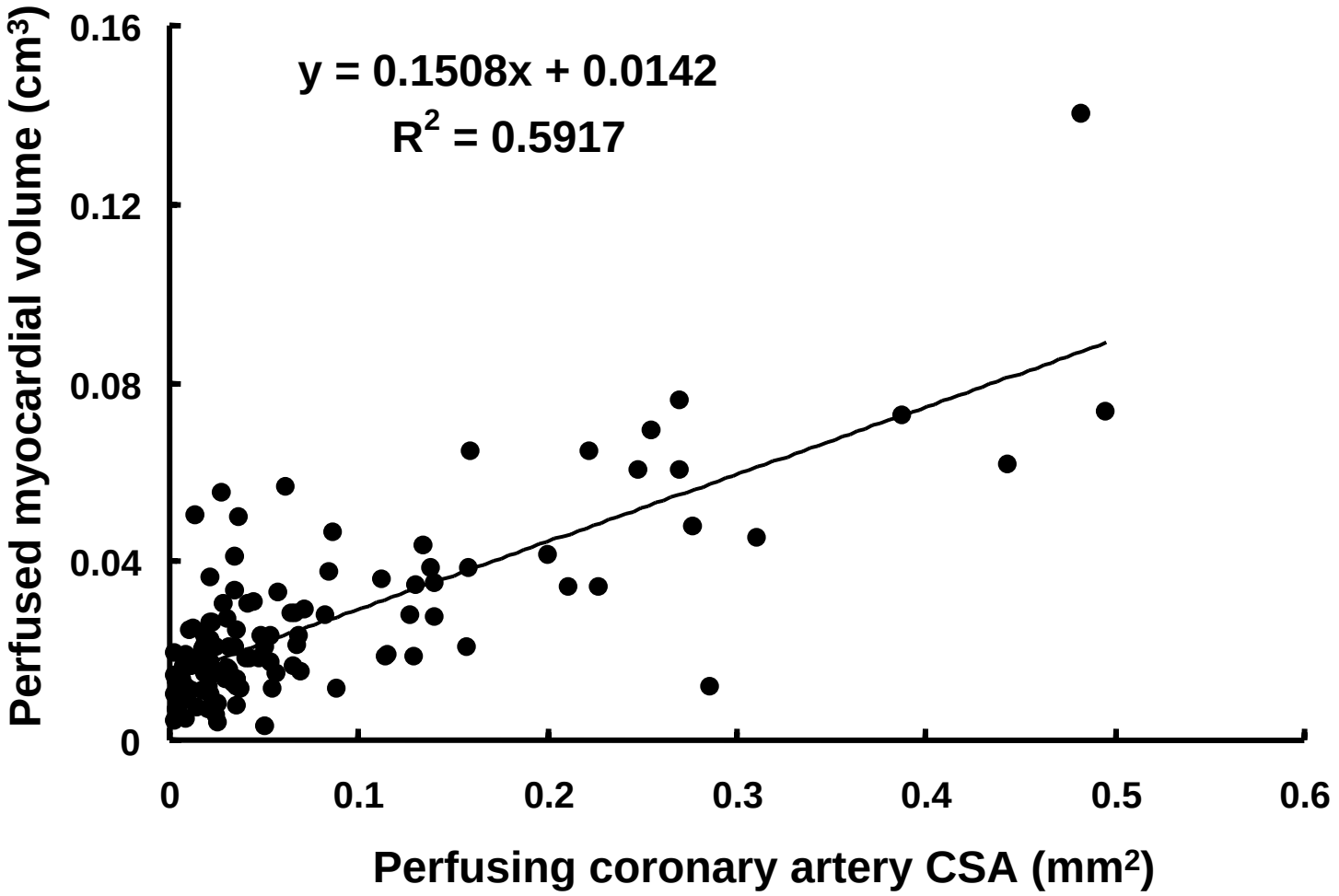


Fig.8

Volume of Myocardium Perfused by its Coronary Artery

Fig.9

Micro-CT of Coronary Artery Vasa Vasorum

(Microfil infusion, 20 μm voxels)

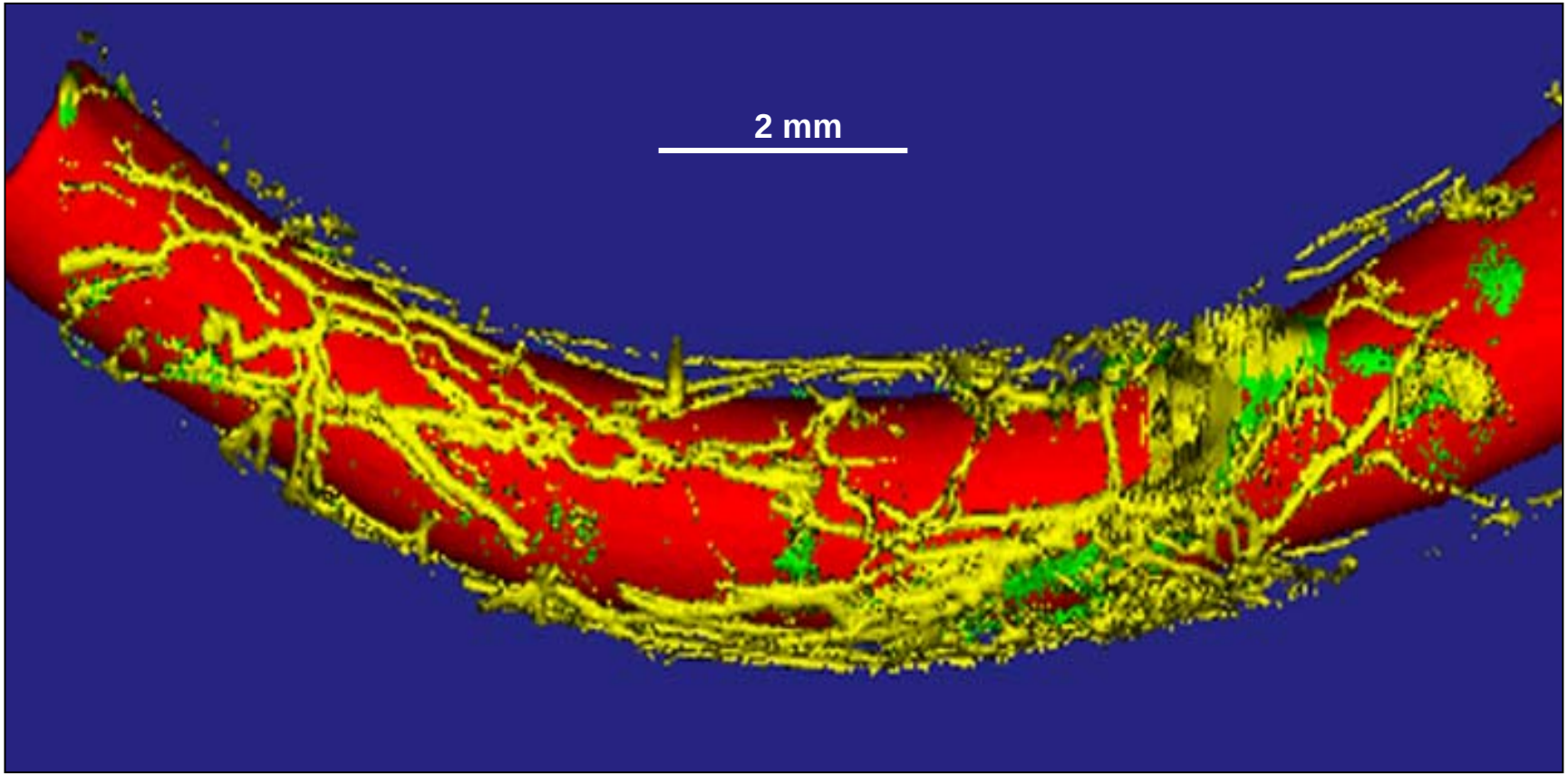


Fig.10

Coronary Artery Vasa Vasorum - Imaging with Micro-CT

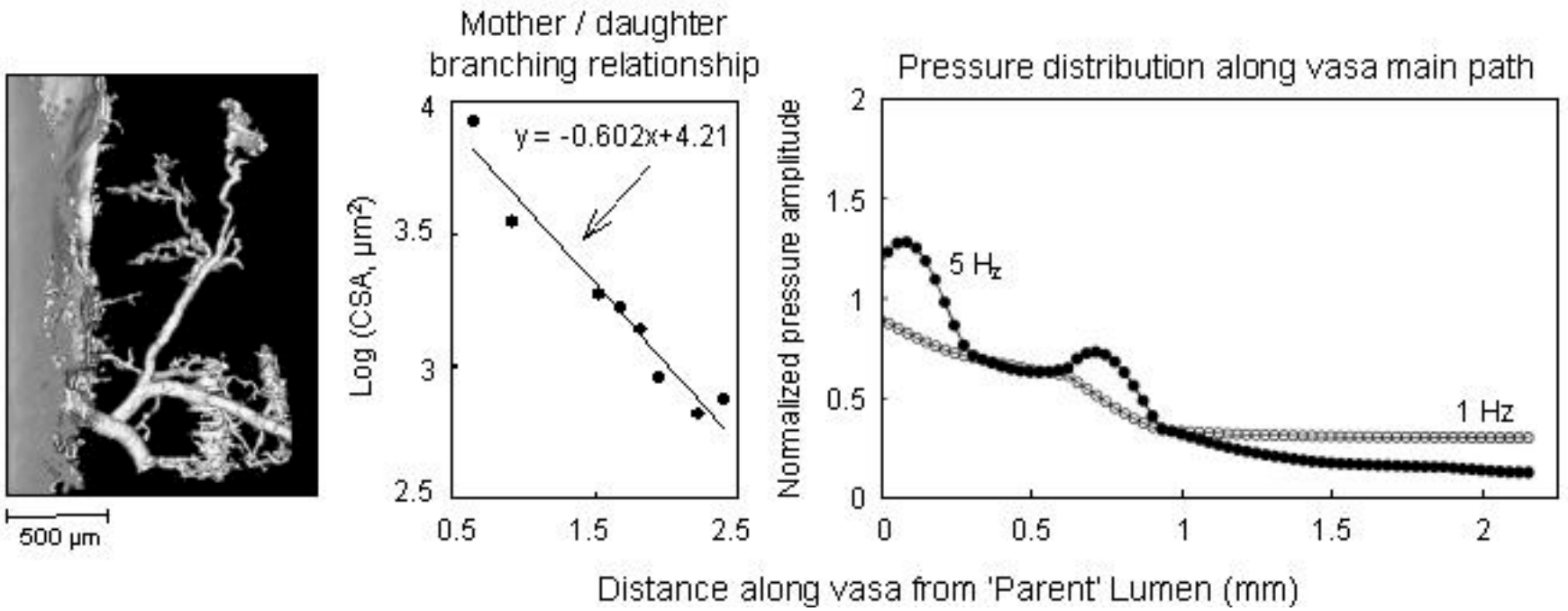
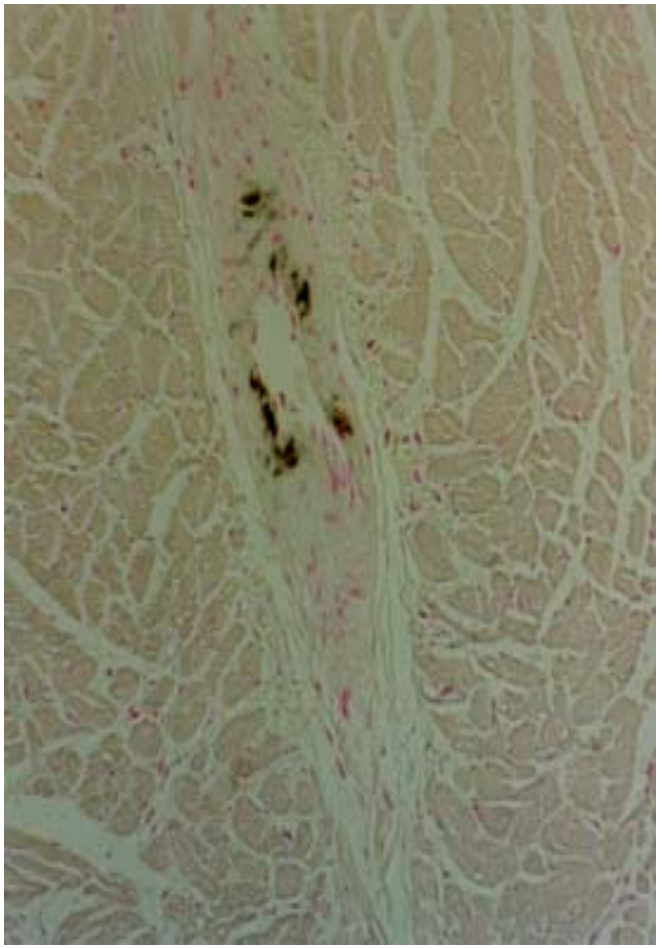


Fig.11

Coronary Artery Calcification in 2 Year Old Ovariectomized Rat

MIP of 3D Micro-CT image of heart

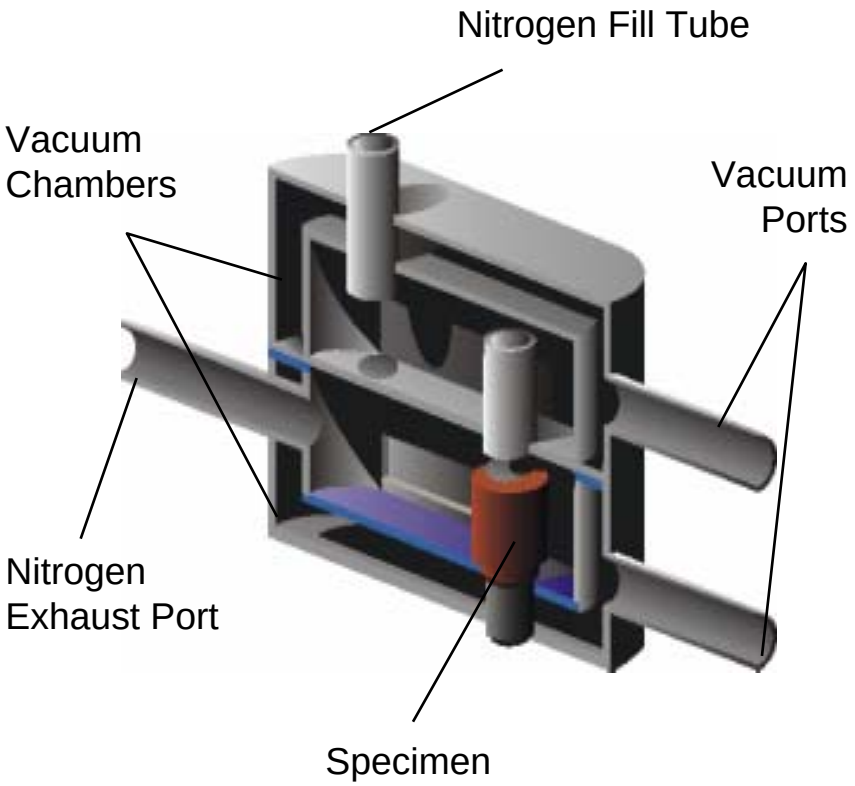


Histological section ,
von Kossa stain for phosphate

Fig.12

Cryogenic Scanning Vessel for Micro-CT

(Liquid nitrogen temperature maintained for 36 hrs.)



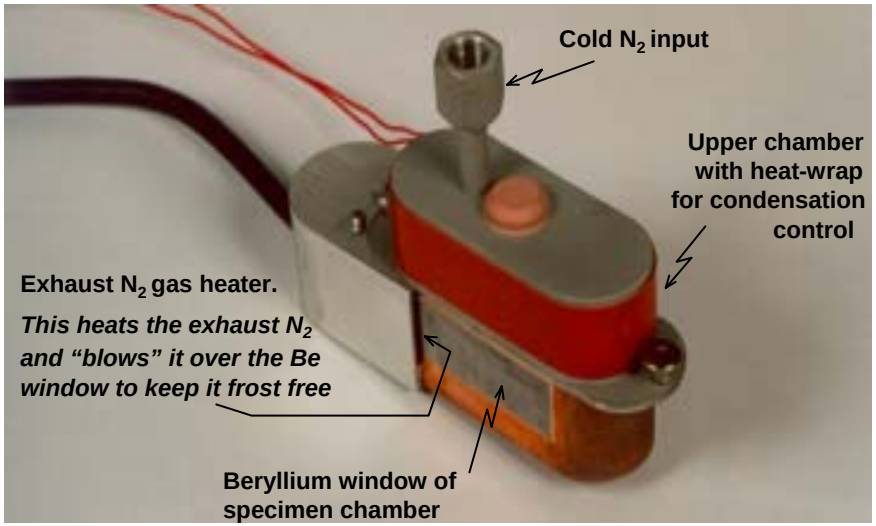


Fig.13

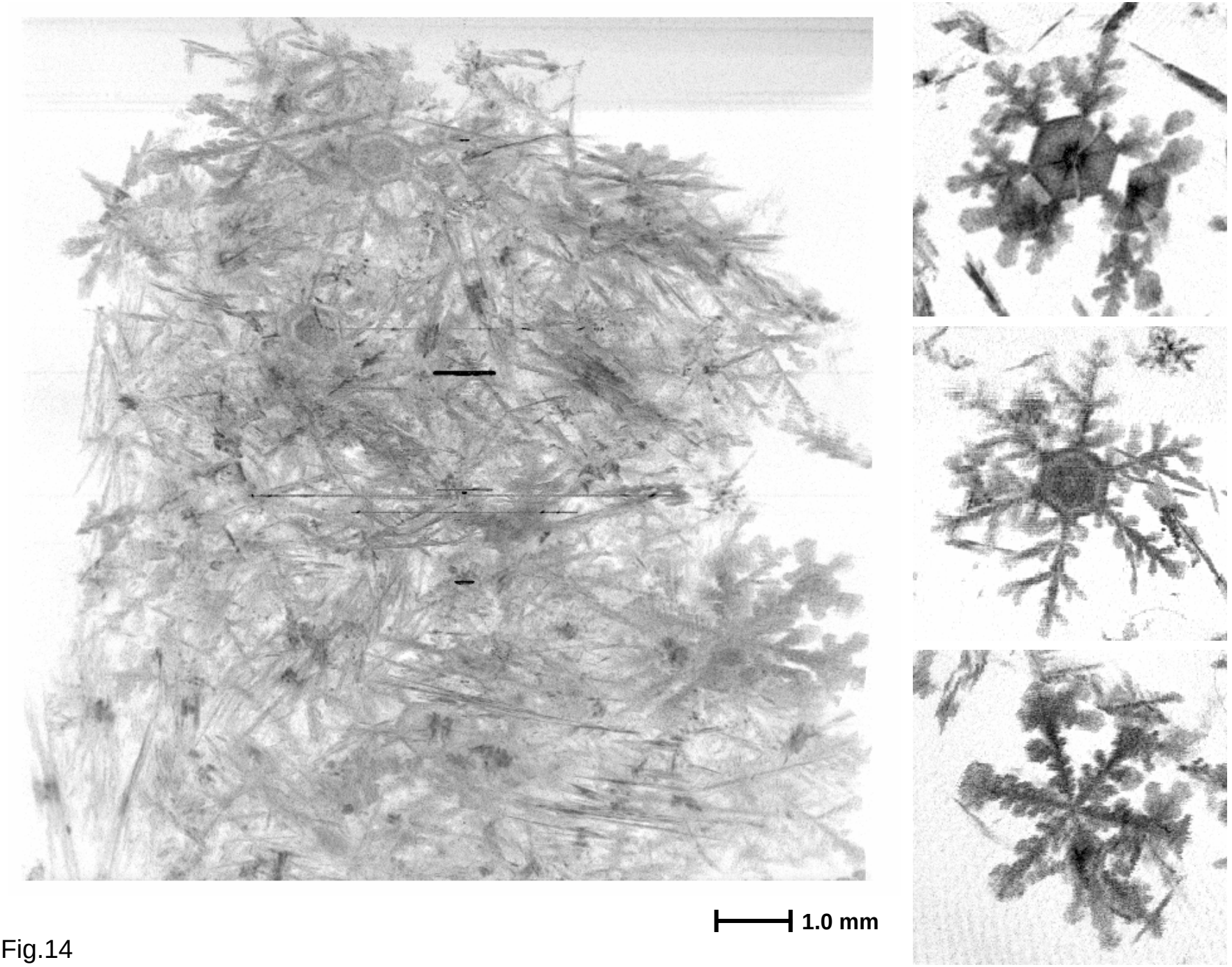
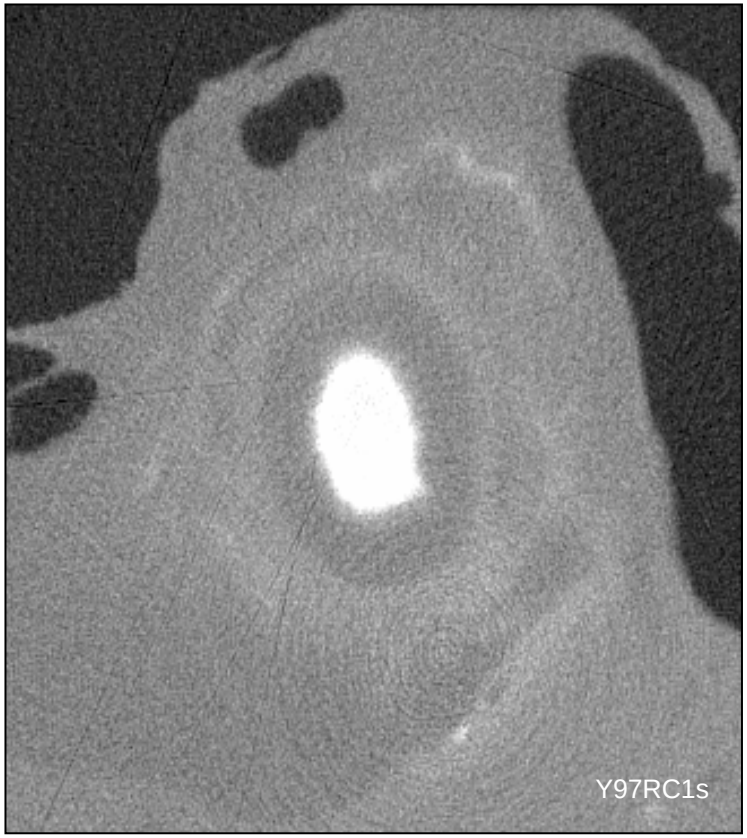


Fig.14

Cryogenic Micro-CT of Stented Carotid Artery Frozen During In Vivo Contrast Injection

(IA Iohexol, pig, reconstruction & display voxel: 17.9 µm)



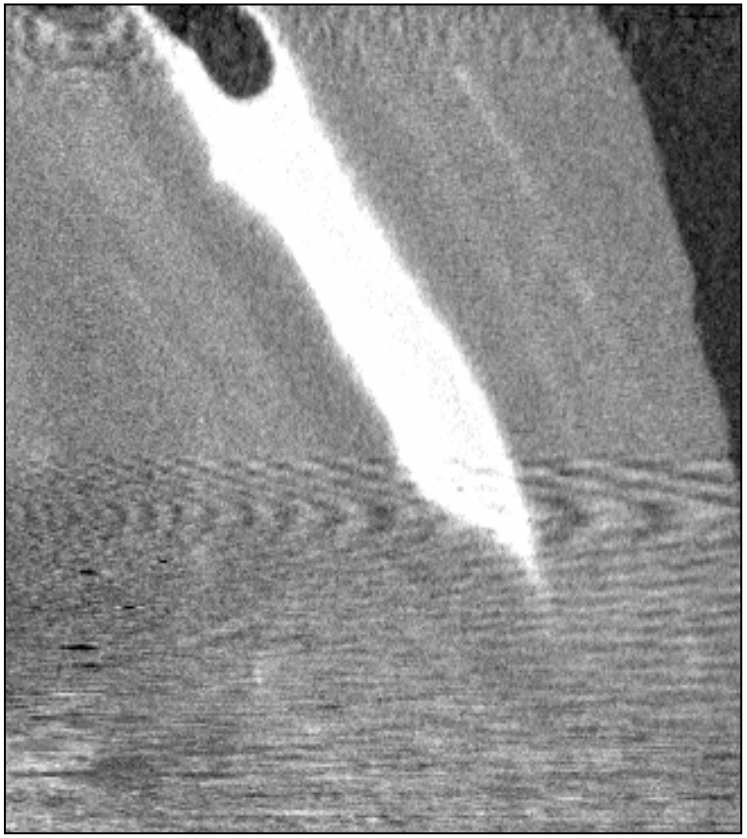


Fig.15

Cryostatic Micro-CT Cross-section of LAD 35 Sec. after End of Contrast Injection

(Anesthetized pig, open chest, IA, non-ionic contrast)

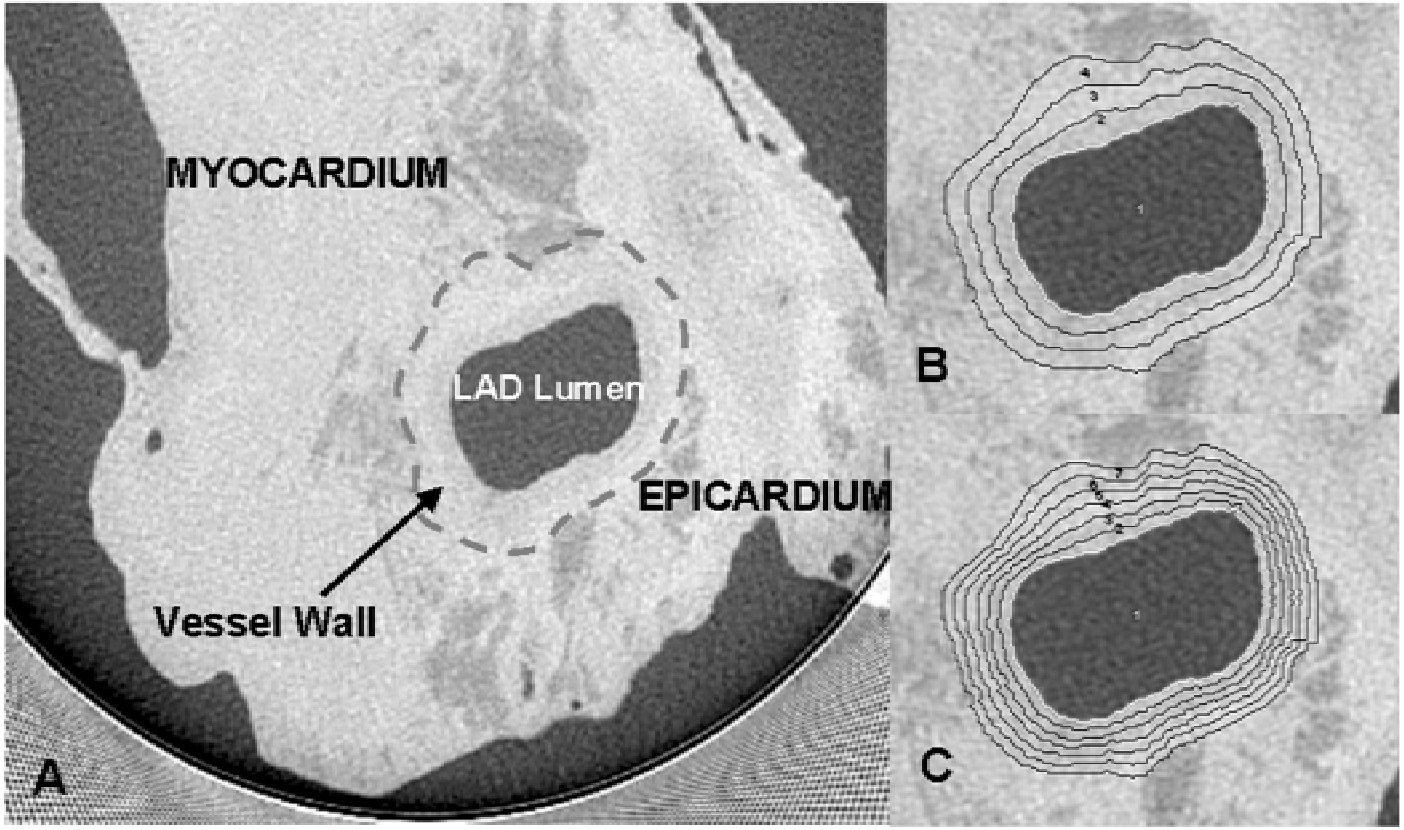


Fig.16

CT Values Coronary Arterial Wall of Pig

(Micro-CT, 20μm voxel, following contrast injection)

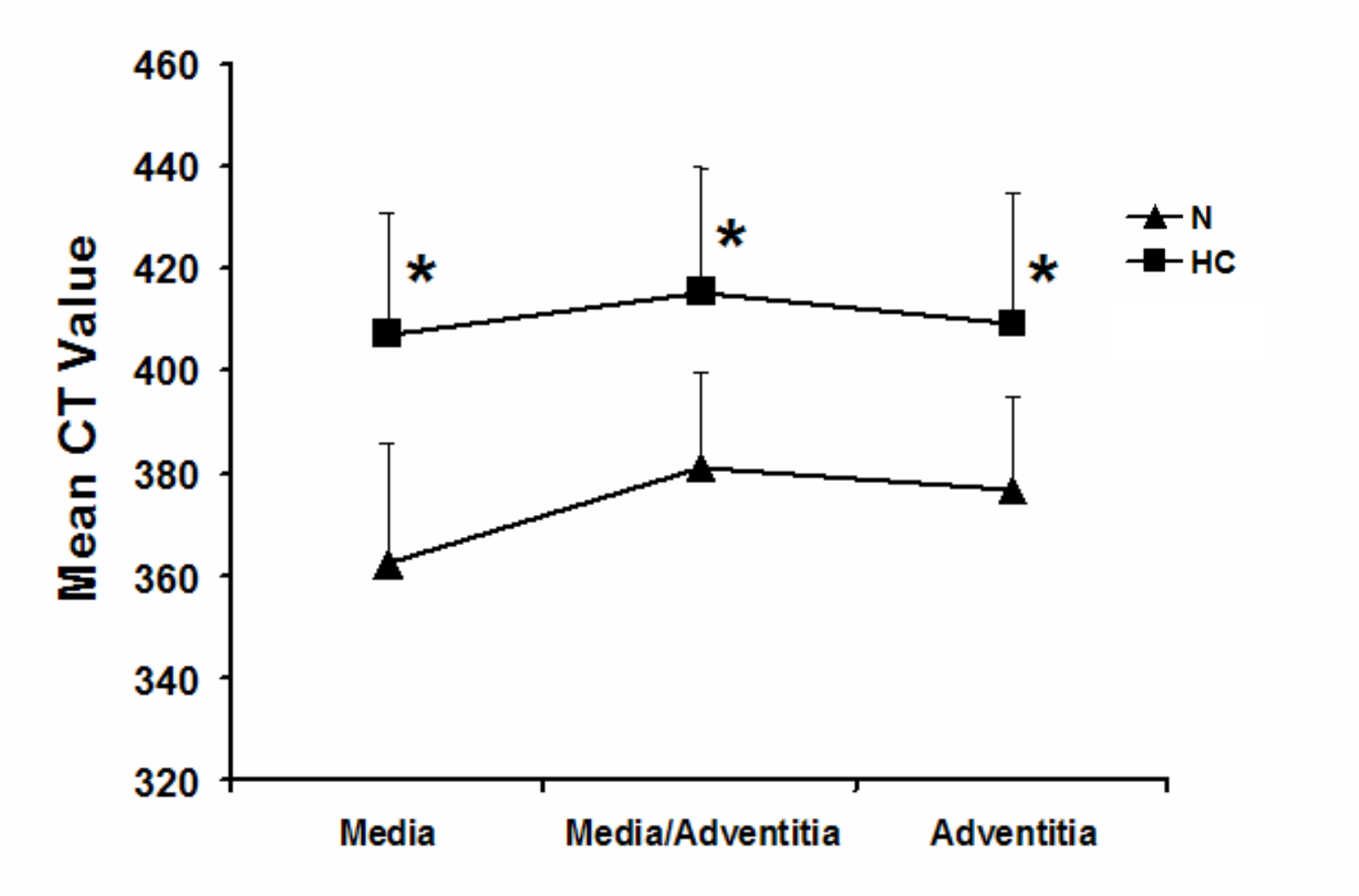


Fig.17

Contrast Delivery & Diffusion in Coronary Arterial Wall

(Cryostaic micro-CT, iohexol IC)

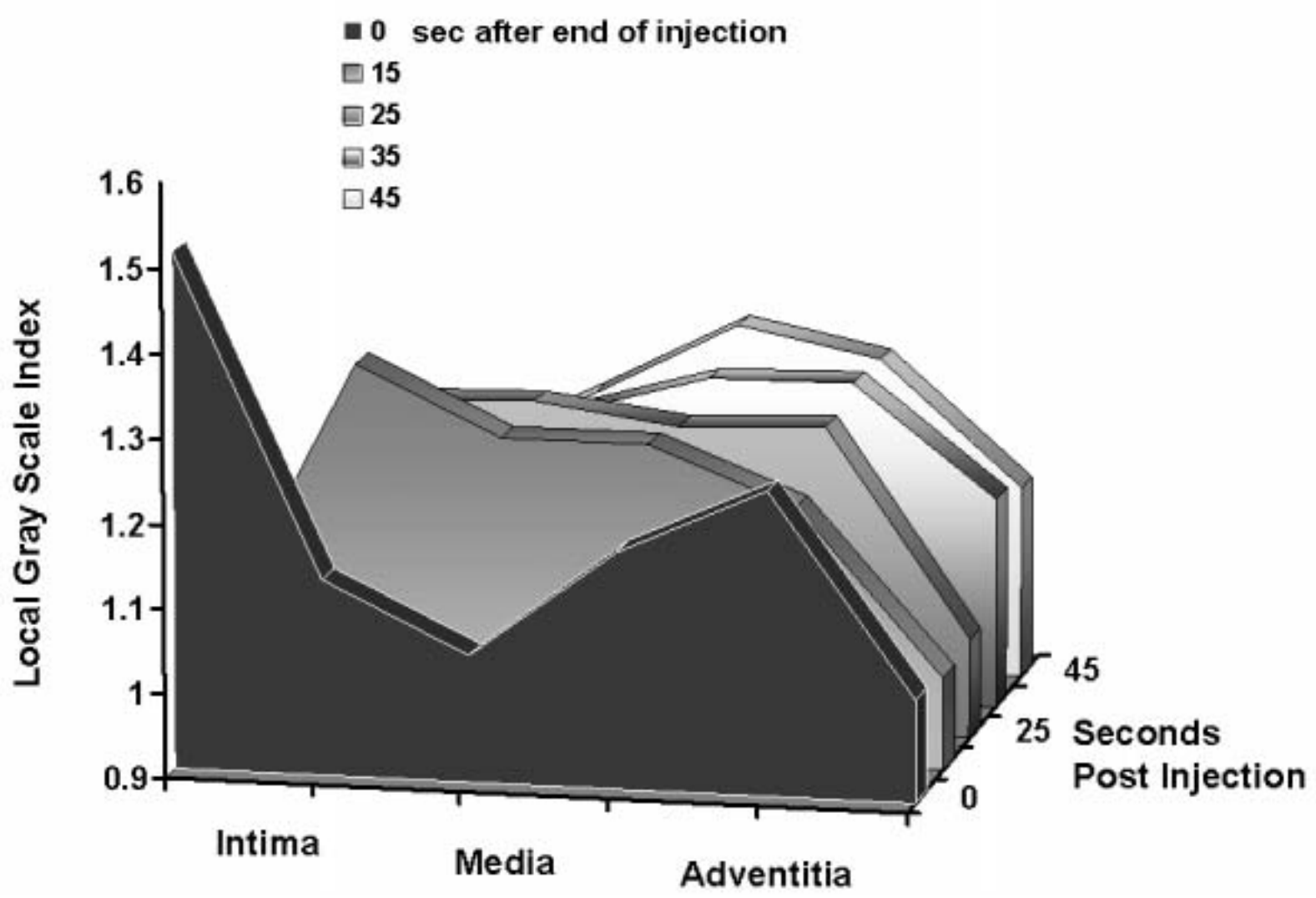
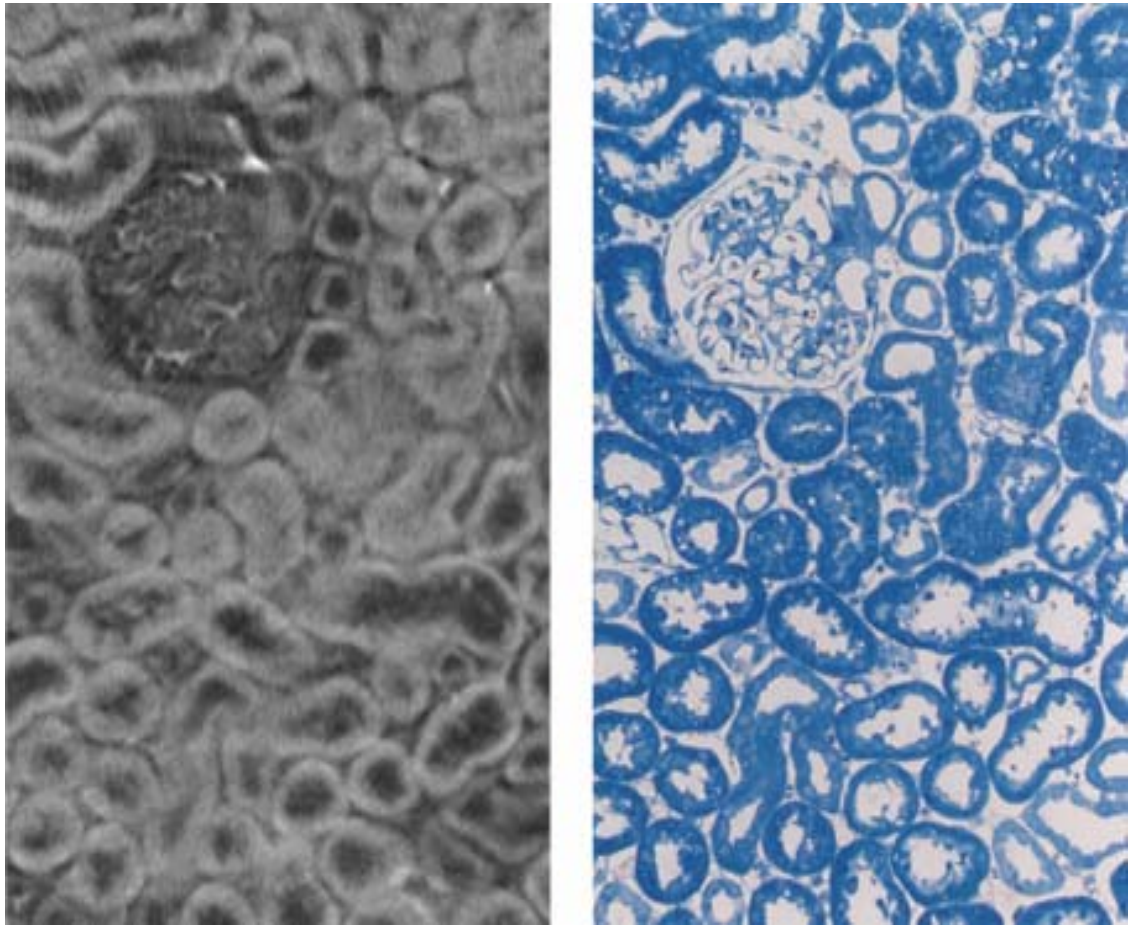


Fig.18

Comparison of Micro-CT & Histological Sections of Rat Kidney

[Micro-CT voxel $(1.0\ \mu m)^3$, histology section, ~1 µm thick]

Micro-CT
(0s 0_4)



Histology
(Me. Blue)

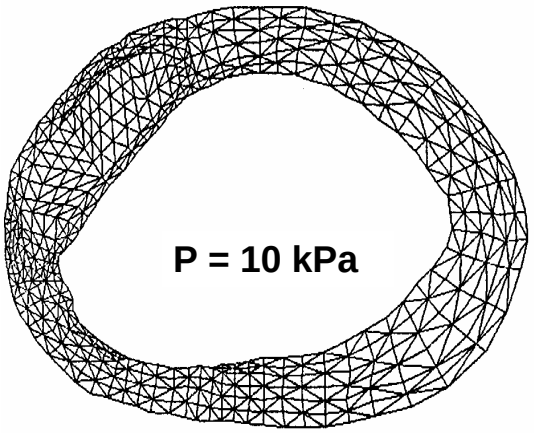
100 µm

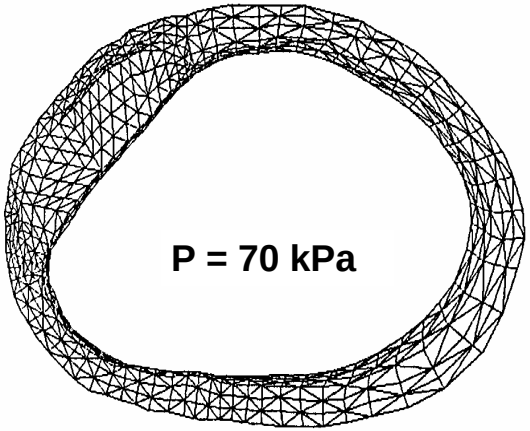
Fig.19

Finite Element Analysis of Coronary Artery Wall Stresses

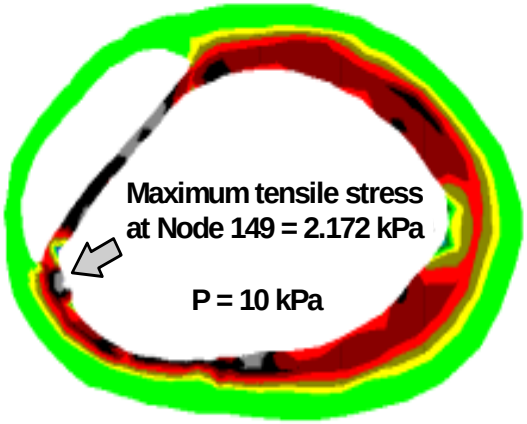
(Atherosclerotic plaque in human coronary artery)

Finite Element Allocation





Computed Stress Distribution



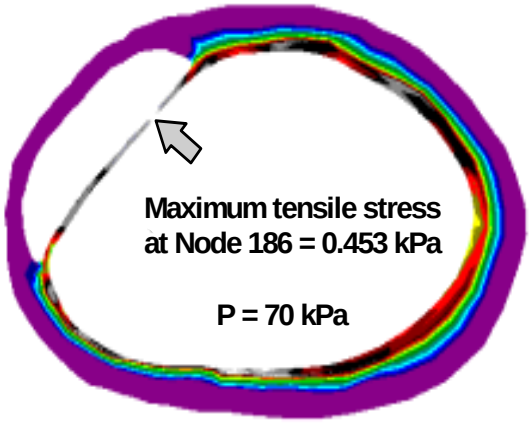
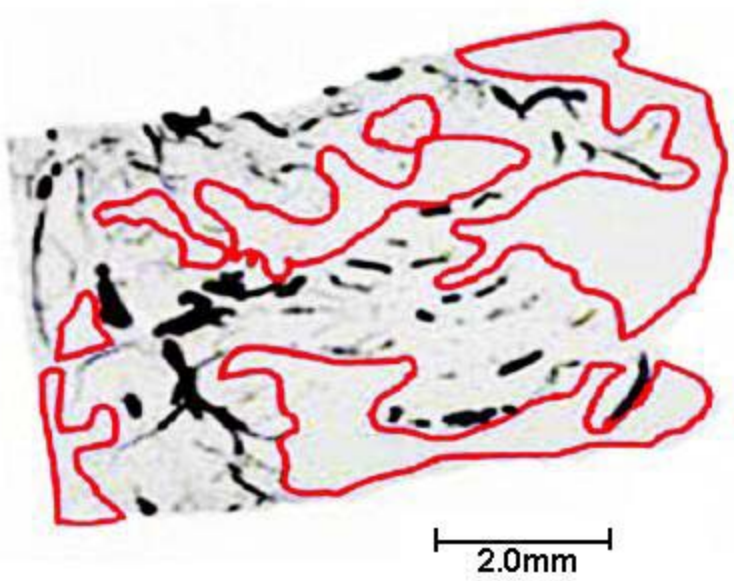


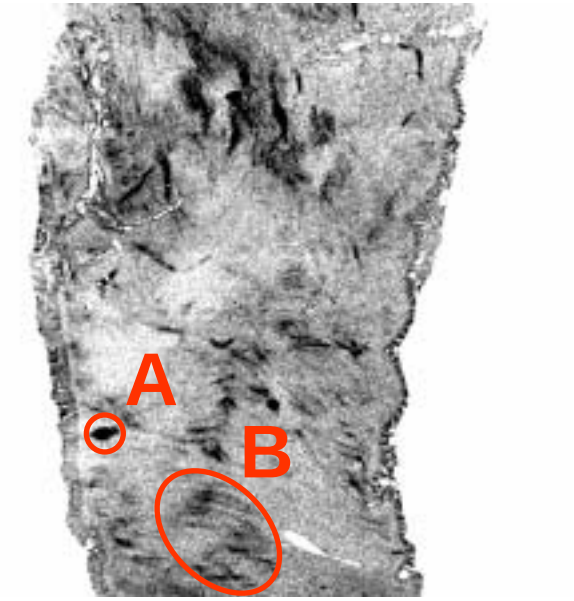
Fig.20

Perfusion Territory in Myocardium

(Micro-CT, micro embolization 100μm ø)



Contrast inject after μ embolization



μ embolization after inject Contrast

Fig.21

μCT Image of BFU & Microvascular perfusion Territory

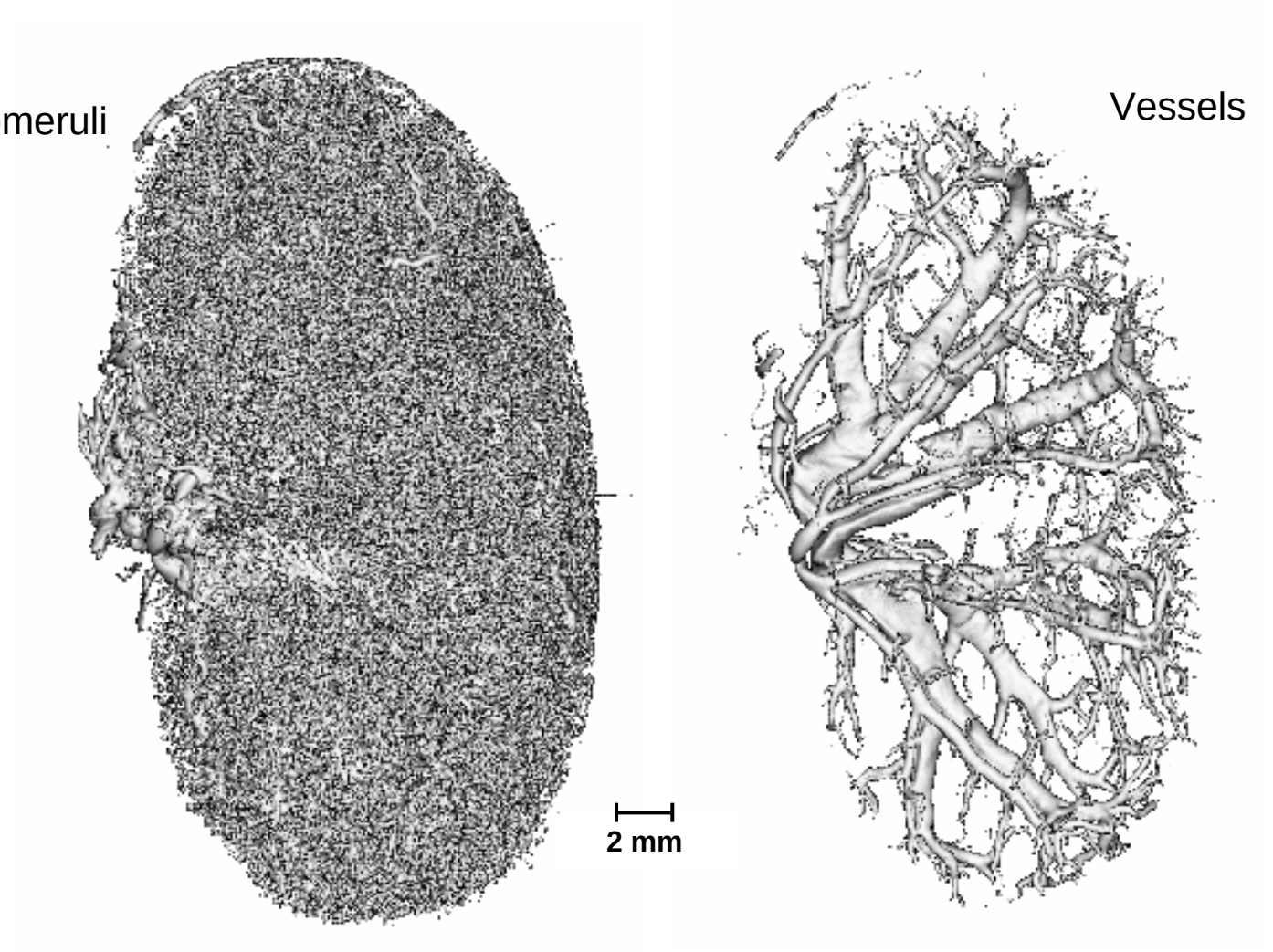


Fig.22

High Resolution Micro-CT of Insitu Nephron in Rat

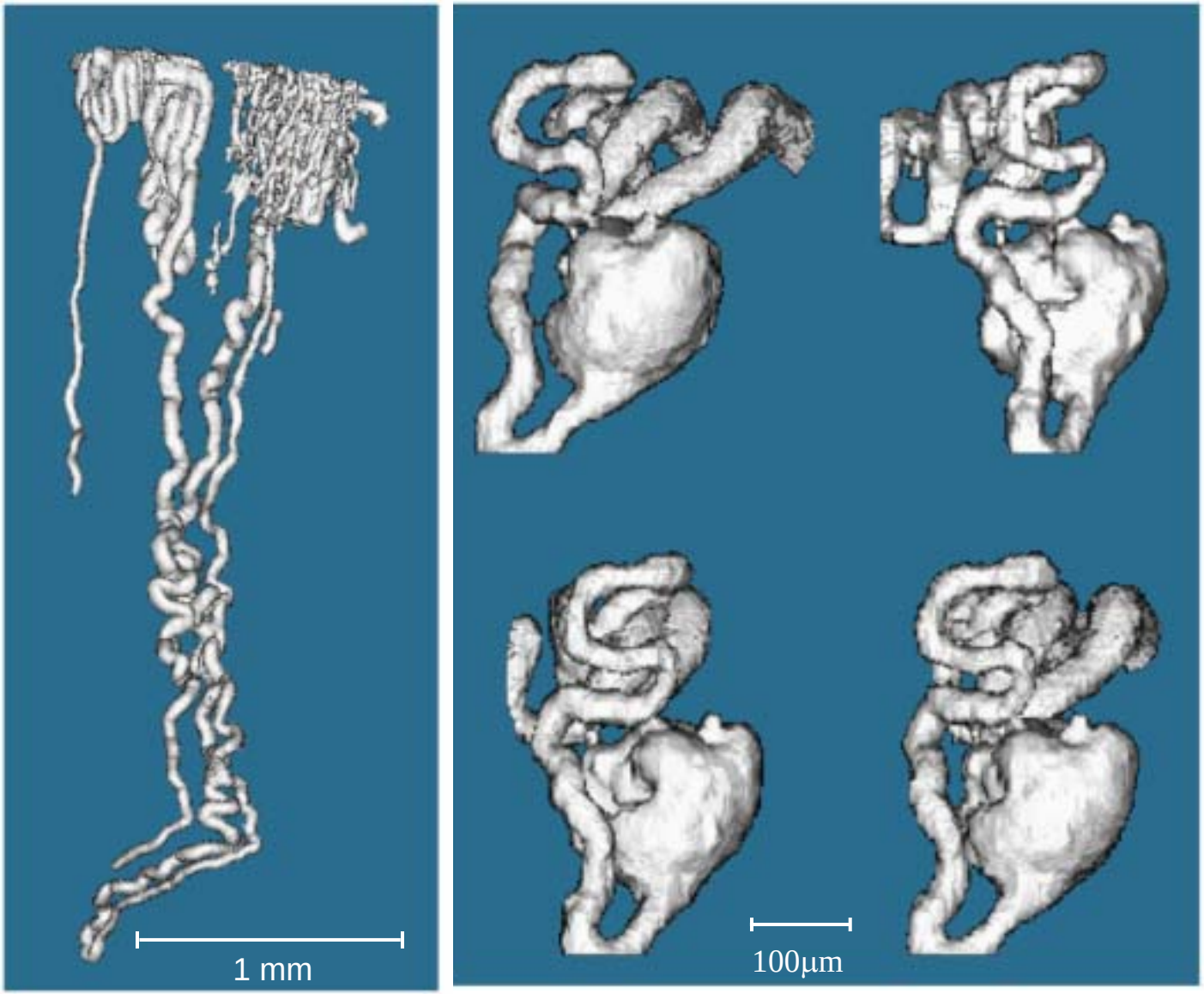


Fig.23

Analysis of 3D Image of a Vascular Tree
Problem 1 – Limited MTF

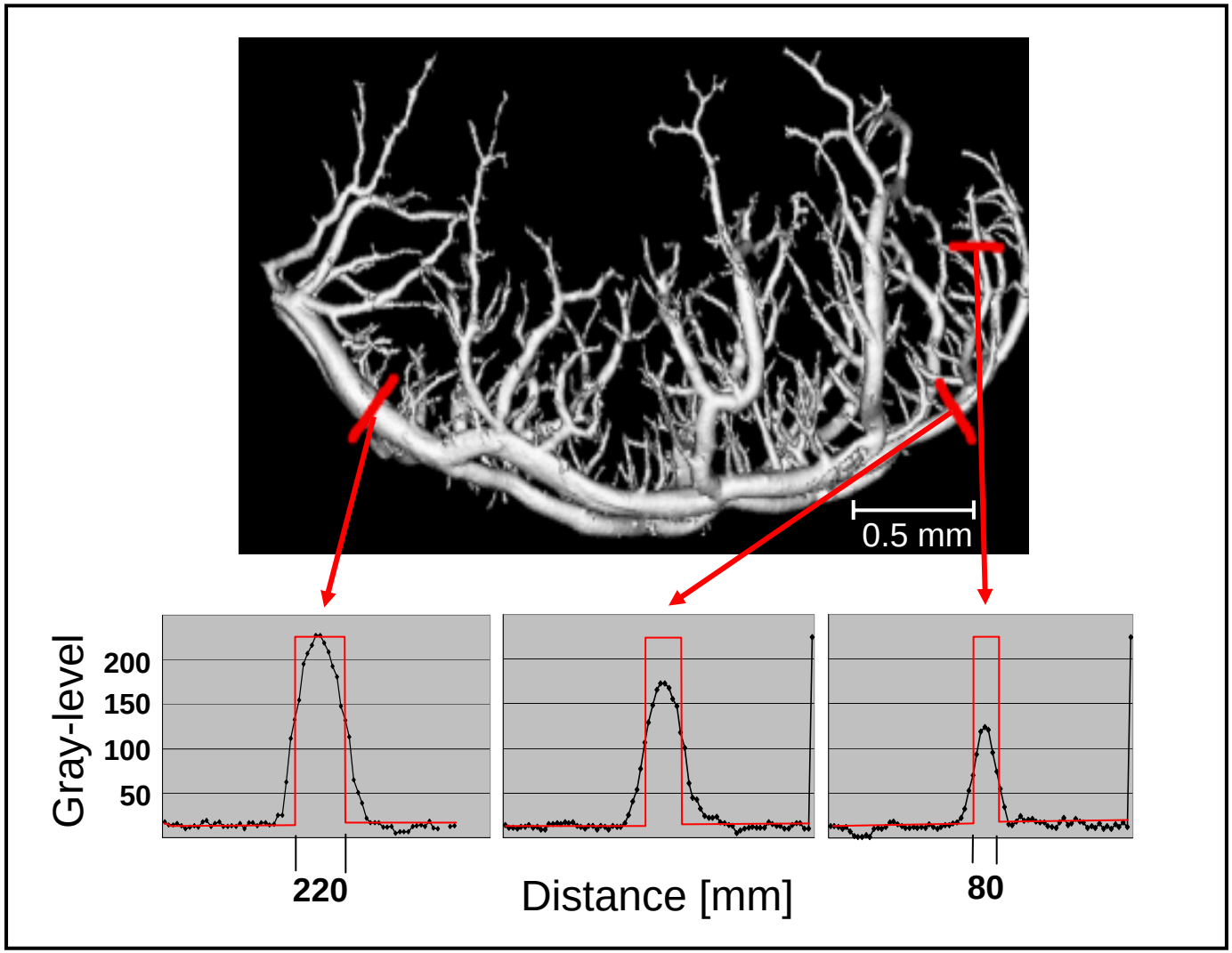
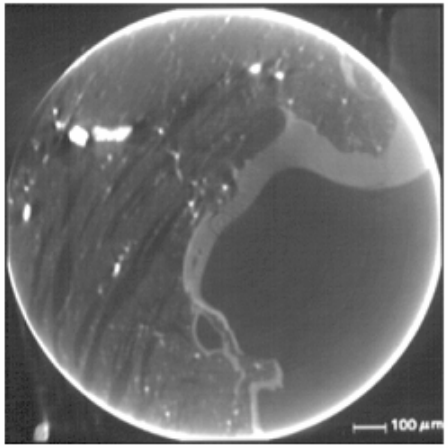
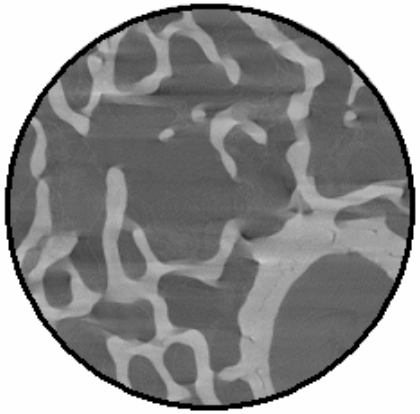


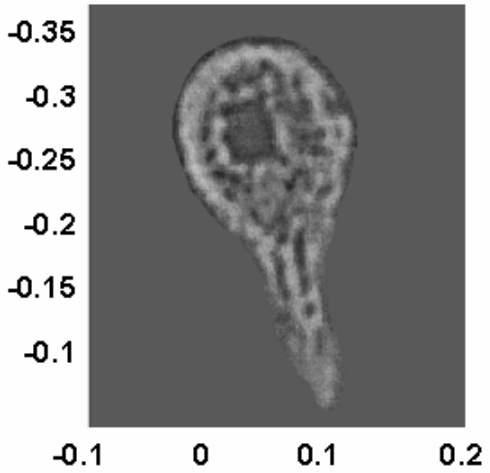
Fig.24



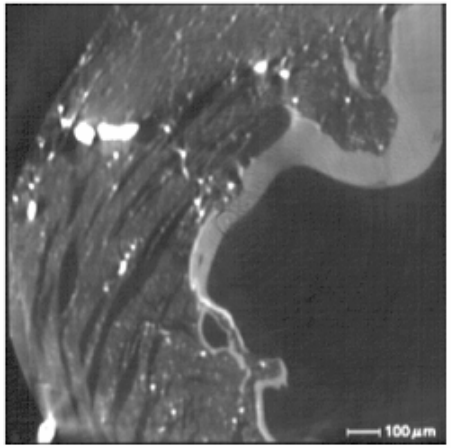
Without Profile Extension



Global

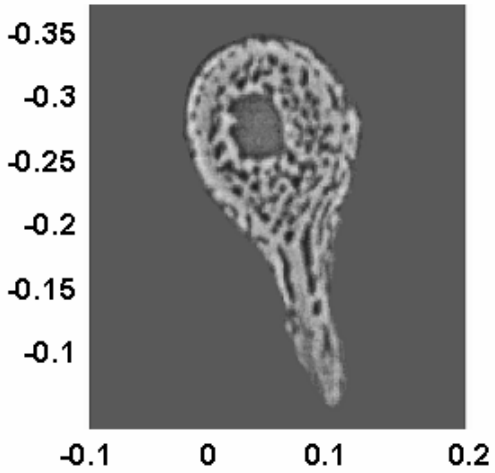


Standard, 1440 views,
366 rays per view



With Profile Extension

Local



1/2 pixel shift, 1440 views,
366 rays per view

Fig.25